

# Metal Oxide Varistor : TVM-G Series



## SMD Type For ESD Suppressor (Low Clamping Series)

### ■ Features

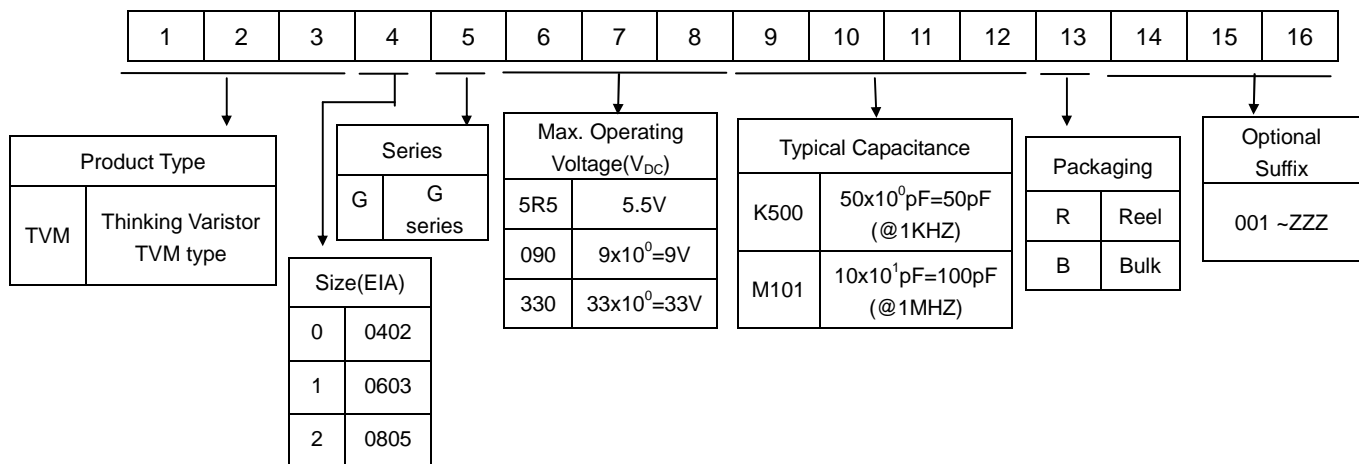
1. RoHS compliant
2. Low clamping voltage
3. EIA size 0402, 0603, 0805
4. Operating voltage: 5.5 ~ 30 Vdc
5. Bidirectional and symmetrical V/I characteristics
6. Multilayer ceramic construction technology
7. Rate for ESD protection
8. Variable capacitance
9. -40 ~ +125°C operating temperature range



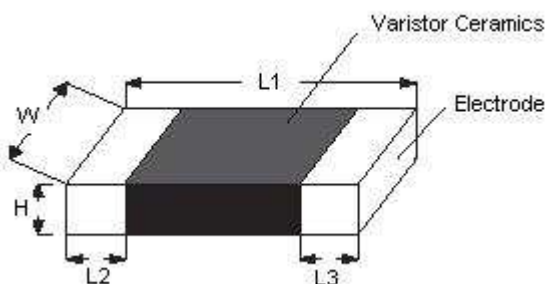
### ■ Recommended Applications

1. Cellular phones
2. I/O port for mother board
3. LCD module
4. Data line (USB, RS232)
5. PDA
6. Bluetooth headset

### ■ Part Number Code



### ■ Structure and Dimensions



(Unit:mm)

Part No.	Size (EIA)	L1	W	H max.	L2 and L3
TVM0	0402	1.00± 0.15	0.50± 0.10	0.60	0.20±0.10
TVM1	0603	1.60±0.15	0.80±0.15	0.95	0.35±0.15
TVM2	0805	2.00±0.20	1.25±0.20	1.20	0.40±0.20

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### ■ Electrical Characteristics

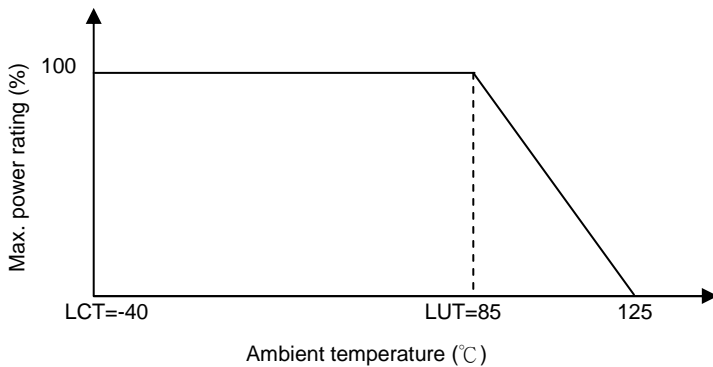
Part No..	Max. Operating Voltage	Varistor Voltage (@ 1mA DC)	Max. Clamping Voltage (8/20us )		Max. Surge Current (8/20us)	Max. Energy (10/1000us)	Typical Capacitance @1MHz
	V <sub>DC</sub> (V)	V <sub>1mA</sub> (V)	V <sub>p</sub> (V)	I <sub>p</sub> (A)	I <sub>max</sub> (A)	W <sub>max</sub> (J)	C (pF)
TVM0G5R5M100	5.5	8.8~13.2	35	1	1	0.01	10
TVM0G5R5M400	5.5	8.8~13.2	30	1	4	0.02	40
TVM0G5R5M900	5.5	8.8~13.2	30	1	10	0.05	90
TVM0G5R5M261	5.5	8.8~13.2	25	1	20	0.05	260
TVM0G5R5M411	5.5	8.8~13.2	25	1	20	0.05	410
TVM1G5R5M761	5.5	8.0~12.0	25	1	30	0.1	760
TVM2G5R5M991	5.5	8.0~12.0	25	1	40	0.1	990
TVM0G090M220	9	11~16	38	1	2	0.02	22
TVM0G090M400	9	11~16	35	1	4	0.02	40
TVM0G090M141	9	11~16	30	1	20	0.05	140
TVM0G090M201	9	11~16	30	1	20	0.05	200
TVM1G090M220	9	11~16	40	1	2	0.02	22
TVM1G090M491	9	11~16	29	1	30	0.1	490
TVM2G090M521	9	11~16	29	1	40	0.1	520
TVM0G140M400	14	15.9~21.5	42	1	4	0.02	40
TVM0G140M900	14	15.9~21.5	38	1	20	0.05	90
TVM0G140M151	14	15.9~21.5	38	1	20	0.05	150
TVM1G140M181	14	15.9~21.5	37	1	30	0.1	180
TVM2G140M321	14	15.9~20.3	34	1	40	0.1	320
TVM2G140M561	14	15.9~20.3	32	1	120	0.3	560
TVM0G180M030	18	46~75	135	1	1	0.01	3
TVM0G180M120	18	22~28	55	1	2	0.03	12
TVM0G180M300	18	22~28	52	1	4	0.05	30
TVM0G180M500	18	22~28	50	1	20	0.05	50
TVM1G180M030	18	46~75	135	1	1	0.01	3
TVM1G180M120	18	22~28	55	1	2	0.03	12
TVM1G180M121	18	22~28	50	1	30	0.1	120
TVM2G180M291	18	22~28	44	1	40	0.1	290
TVM2G180M521	18	22~28	44	1	120	0.3	520
TVM1G260M111	26	31~38	60	1	30	0.1	110
TVM2G260M141	26	29.5~38.5	60	1	40	0.1	140
TVM2G260M221	26	29.5~38.5	60	1	100	0.3	220
TVM1G300M900	30	37~46	74	1	30	0.1	90
TVM2G300M900	30	37~46	72	1	30	0.1	90

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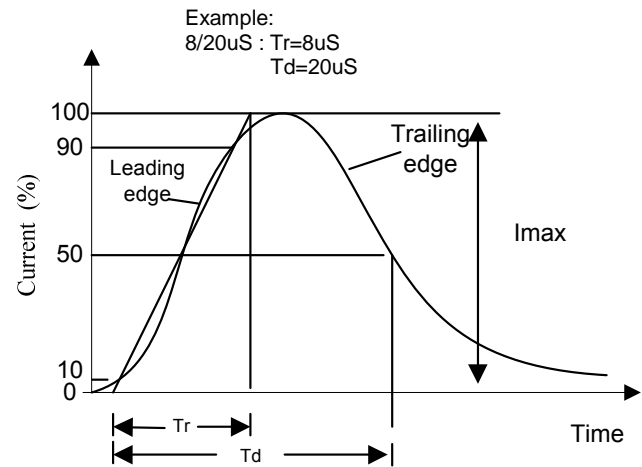


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### ■ Power Derating Curve

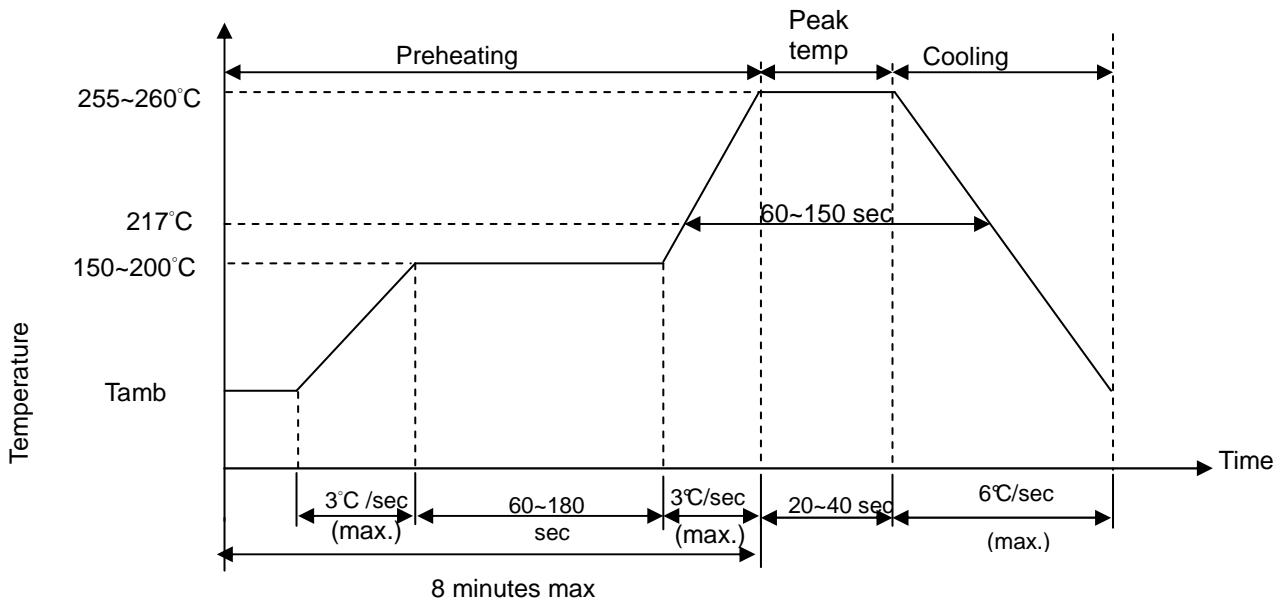


### ■ Surge Current Standard Waveform



### ■ Soldering Recommendation

#### ● IR-Reflow Soldering Profile



#### ● Reworking Conditions with Soldering Iron

Item	Conditions
Temperature of Soldering Iron-tip	360°C (max.)
Soldering Time	3 sec (max.)
Diameter of Soldering Iron-tip	Φ 3mm (max.)

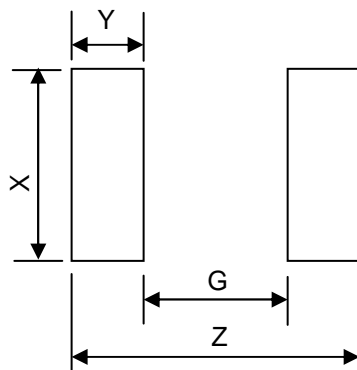
Caution: Do not touch the component surface with soldering iron directly to prevent it from damage.

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### ■ Recommended Soldering Pad Dimensions



Size	Z (mm)	G (mm)	X (mm)	Y (mm)
0402	2.1~2.2	0.4~0.5	0.6~0.7	0.9~1.0
0603	2.7~2.8	0.6~0.7	0.9~1.0	1.0~1.1
0805	3.1~3.2	0.6~0.7	1.4~1.5	1.2~1.3

Followed Standard:IPC-SM-782A

### ■ Storage Conditions of Products

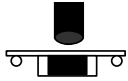
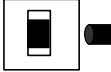
- Storage Conditions :
  1. Storage Temperature:  $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$
  2. Relative Humidity:  $\leq 75\% \text{RH}$
  3. Keep away from corrosive atmosphere and sunlight.
- Period of Storage : 1 year

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### ■ Reliability

Item	Standard	Test conditions / Methods	Specifications															
Bending Strength	IEC 1051-1	Warp:2mm ; Speed<0.5mm/sec Duration : 10 sec on PCB.. 	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage															
Adhesion	Specification standard	Speed < 0.5mm/sec. on PCB 	$W \geq 0.5\text{Kgf}$ the terminal electrode shall be break off not the chip element															
Damp Heat Load, Steady State	IEC 1051-1	$40 \pm 2^\circ\text{C}$ 90~95% RH $500 \pm 24$ hrs at $V_{DC}$	$ \Delta V_{1mA}/V_{1mA}  \leq 10\%$ No visible damage															
High Temp. Storage	IEC 1051-1	$125 \pm 5^\circ\text{C}$ x $1000 \pm 24$ hrs	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage															
Rapid Change of Temperature	IEC 1051-1	The conditions shown below shall be repeated 5 cycles on PCB <table border="1" data-bbox="507 929 1193 1189"> <thead> <tr> <th>Step</th> <th>Temperature (<math>^\circ\text{C}</math>)</th> <th>Period (minutes)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td><math>-40 \pm 5</math></td> <td><math>30 \pm 3</math></td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td><math>5 \pm 3</math></td> </tr> <tr> <td>3</td> <td><math>125 \pm 5</math></td> <td><math>30 \pm 3</math></td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td><math>5 \pm 3</math></td> </tr> </tbody> </table>	Step	Temperature ( $^\circ\text{C}$ )	Period (minutes)	1	$-40 \pm 5$	$30 \pm 3$	2	Room temperature	$5 \pm 3$	3	$125 \pm 5$	$30 \pm 3$	4	Room temperature	$5 \pm 3$	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage
Step	Temperature ( $^\circ\text{C}$ )	Period (minutes)																
1	$-40 \pm 5$	$30 \pm 3$																
2	Room temperature	$5 \pm 3$																
3	$125 \pm 5$	$30 \pm 3$																
4	Room temperature	$5 \pm 3$																
High Temp. Load	IEC 1051-1	$85 \pm 2^\circ\text{C}$ $1000 \pm 24$ hrs at $V_{DC}$	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage															
Low Temp. Load	Specification standard	$-40 \pm 5^\circ\text{C}$ $1000 \pm 24$ hrs at $V_{DC}$	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage															
Max. Energy	Specification standard	10/1000 $\mu\text{S}$ Waveform, $W_{max}$ , 1 surge current	$ \Delta V_{1mA}/V_{1mA}  \leq 10\%$ No visible damage															
Vibration	IEC 1051-1	Frequency range:10~55Hz Amplitude:0.75mm or 98m/S <sup>2</sup> Direction:3 mutually perpendicular directions,2hrs each	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage															
Varistor Voltage Temp. Coefficient	Specification Standard	measure $V_{1mA}$ at $-40^\circ\text{C}$ 、 $25^\circ\text{C}$ 、 $125^\circ\text{C}$	$ Tc  \leq 0.05\%/^\circ\text{C}$															
Climatic Sequence	IEC 1051-1	a. $125^\circ\text{C}$ x 16 hrs b. 1st cycle : $55^\circ\text{C}$ 93%RH x 24 hrs c. $-40^\circ\text{C}$ x 2 hrs d. 5 cycles : $55^\circ\text{C}$ 93%RH x 24 hrs/cycle	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage															
Solderability	IEC 60068-2-20	$235 \pm 5^\circ\text{C}$ $2 \pm 0.5$ sec	At least 95% of terminal electrode is covered by new solder															
Resistance to Soldering Heat	IEC 60068-2-20	$260 \pm 5^\circ\text{C}$ $10 \pm 1$ sec	$ \Delta V_{1mA}/V_{1mA}  \leq 5\%$ No visible damage															
Electrostatic Discharge (ESD)	IEC 61000-4-2	Contact discharge test voltage : 8KV Polarity : Positive/Negative Number of test pulse : 10/10 times Discharge network : 150pF,330 $\Omega$ Operating temperature : 15~35 $^\circ\text{C}$ Operating humidity : 25~75 RH	1. $CP \leq 2\text{pF}$ $ \Delta V_{1mA}/V_{1mA}  \leq 30\%$ $\alpha \geq 8, \text{I.L.} \leq 20\mu\text{A}$ 2. $CP > 2\text{pF}$ $ \Delta V_{1mA}/V_{1mA}  \leq 10\%$ $\alpha \geq 8, \text{I.L.} \leq 20\mu\text{A}$ No visible damage															

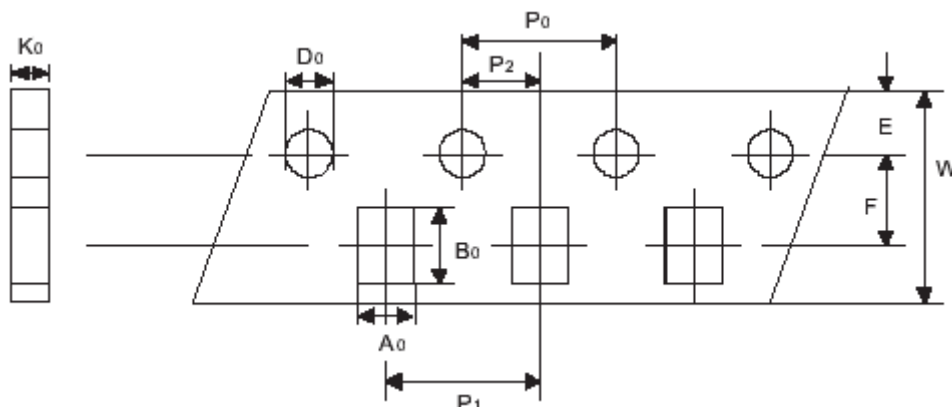
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### ■ Packaging

#### ● Taping Specification

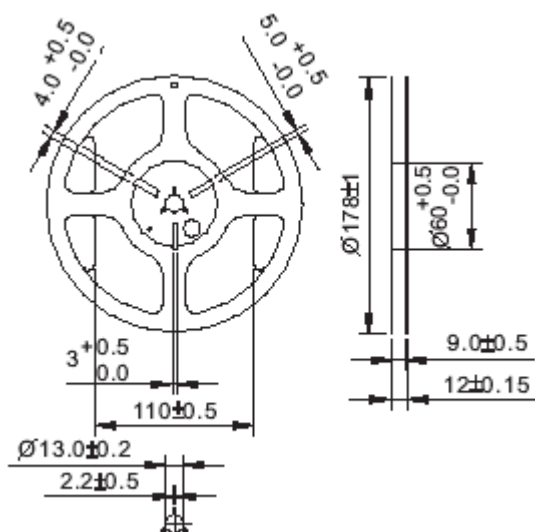


(Unit: mm)

Index Type	$A_0$	$B_0$	$W$	$E$	$F$	$P_1$	$P_2$	$P_0$	$D_0$	$K_0$
0402	$\pm 0.05$	$\pm 0.12$	$\pm 0.2$	$\pm 0.1$	$\pm 0.05$	$\pm 0.1$	$\pm 0.05$	$\pm 0.1$	$\pm 0.1$	$\pm 0.1$

Index Type	$A_0$	$B_0$	$W$	$E$	$F$	$P_1$	$P_2$	$P_0$	$D_0$	$K_0$
0603	$\pm 0.2$	$\pm 0.2$	$\pm 0.2$	$\pm 0.1$	$\pm 0.05$	$\pm 0.1$	$\pm 0.05$	$\pm 0.1$	$\pm 0.1$	$\pm 0.1$
0805	1.5	2.3	8	1.75	3.5	4	2	4	1.55	0.95

#### ● Quantity



(Unit: mm)

Type	Quantity (pcs/reel)
0402	10000
0603	4000
0805	3500